

Fertilizer & Pesticide

Water Standards

For Montana's Ground Water And Surface Water

Ground water and surface water is never simply a pure combination of hydrogen and oxygen. It naturally contains many impurities, reflecting the composition of the soils, sand, gravel and rock through which the water has moved. Some of ground water's *traveling companions* (such as bacteria and viruses) can effect people's health. Some (such as minerals) may make the water taste bad. Others (like industrial pollutants, and other hazardous wastes) may become long-term health hazardous. Consequently, the Montana Water Quality Act provides for classification of ground and surface water. The Act establishes water quality standards for ground and surface water, and provides for a permit program to regulate discharge of pollutants into state waters.

Classification of Ground Water and Surface Water in Montana

In the Montana Water Quality Act, the classification of ground water and surface water in Montana are divided into *Class I through Class IV* waters. The classes are based on the beneficial uses and the specific conductance of the ground water. Specific conductance measures salt levels in water. Class I ground water ratings are of the highest quality and

Classification of ground water (Montana Water Quality Act, 1991).

Class	Beneficial Uses	Specific Conductance
I	Public and private water supplies; culinary and food processing; irrigation, livestock and wildlife watering; commercial and industrial purposes.	Less than 1000 µmhos/cm at 77° F
II	Marginal for public and private water supplies, culinary and food processing; irrigation of some crops; drinking water for most wildlife and livestock; most commercial and industrial purposes.	1000 - 2500 µmhos/cm at 77° F
III	Some industrial and commercial uses; drinking water for some wildlife and livestock; irrigation of some salt tolerant crops using special water management practices.	2500-15,000 µmhos/cm at 77° F
IV	Some commercial and industrial uses only.	Greater than 15,000 µmhos/cm at 77° F

Class IV are of the lowest water quality.

Montana surface waters are also divided into different classifications in the Administrative Rules of Montana. The surface water classifications are based on the beneficial uses of each class of water.

Pesticide Residues and Nutrients

The Montana General Agricultural Chemical Ground Water Management Plan addresses pesticide and nutrient use and best management practices to implement to prevent impairment of ground water and surface water. The following contaminant levels are established concentrations of pesticides and residues that are allowed in water.

Maximum contaminant levels A maximum contaminant level or MCL are the highest concentration of a contaminant allowable in a public water supply. These MCLs are specified in the National Primary Drinking Water Standards for the United States. There are no known adverse health effects that exist at the recommended MCLs. MCLs are based on a lifetime exposure with a consumption of 0.52 gallons of water per day. This provides good protection to all people using a public water supply.

Secondary maximum contaminant levels A secondary maximum con-

Classification of surface water (Administrative Rules of Montana, 1988).

Class	Rule	Beneficial Uses
A-Closed	16.20.616	Drinking water, culinary and food processing after simple disinfection; swimming and recreation, growth and propagation of fishes and associated aquatic life.
A-I	16.20.617	Drinking water, culinary food processing after conventional treatment to remove natural impurities; bathing, swimming, and recreation; growth and propagation of salmonoid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
B-I	16.20.618	Drinking, culinary and food processing after conventional treatment, bathing, swimming, and recreation; growth and propagation of salmonoid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
B-2	16.20.619	Drinking, culinary and food processing after conventional treatment; bathing, swimming, and recreation; growth and marginal propagation of salmonoid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
B-3	16.20.620	Drinking, culinary and food processing after conventional treatment; bathing, swimming, and recreation; growth and propagation of non-salmonoid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
C-I	16.20.621	Bathing, swimming, and recreation; growth and propagation of salmonoid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
C-2	16.20.622	Bathing, swimming, and recreation; growth and marginal propagation of salmonoid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
	16.20.623	Drinking, culinary and food processing after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply.
C-3	16.20.624	Bathing, swimming, and recreation; growth and propagation of non-salmonoid fishes and associated aquatic life, waterfowl and furbearers. Marginal for drinking, culinary and food processing; agricultural and industrial water supply.

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Extension Service

taminant level has been established for contaminants that may affect taste, odor, color and appearance of drinking water. These MCLs have also been established to prevent adverse health affects. Although secondary MCLs represent reasonable goals for drinking water, they are not federally enforceable. Yet, each state is encouraged to implement the secondary MCLs.

Health advisories Health advisories are guidance documents issued by the Environmental Protection Agency. These health advisories contain information on health risks, water treatment technologies and specify levels of chemical concentrations in water that are acceptable for drinking. The EPA reviews available human data and experimental animal studies in evaluating potential human health effects. The health advisories are updated as new information becomes available.

Health Effects

Pesticide residues and nutrients in drinking water may cause health problems. Pesticides, if ingested in large quantities over a relatively short period of time may cause damage to the nervous system and internal organs of both animals and humans. Long term effects on humans are unclear and studies are ongoing.

Nutrient impairment of ground water by nitrate can endanger the lives of children under the age of one year. Infants can develop a

Maximum contaminant levels (MCL) for some commonly used agricultural chemicals in Montana. If a MCL has not been assigned to a particular chemical, the health advisory number has been used (United States Environmental Protection Agency, 1992).

Agricultural Chemical	MCL	Lifetime Health Advisory
Pesticide	---- mg/l or ppm ----	
Alachlor	0.002	
Atrazine	0.003	
Carbaryl		0.7
Carbofuran	0.04	
Chlordane	0.002	
Dalapon	0.20	
Diazinon		0.0006
Dibromochloro-propane (DBCP)	0.0002	
Dicamba		0.2
Dinoseb	0.007	
Diquat	0.02	
Endothall	0.10	
Endrin	0.002	
Ethylene dibromide (EDB)	0.00005	
Glyphosate	0.7	
Heptachlor	0.0004	
Heptachlor epoxide	0.0002	
Lindane	0.0002	
Malathion		0.2
Methoxychlor	0.04	
Metribuzin		0.2
Oxamyl (Vydate)	0.20	
PCB's	0.0005	
Pentachlorophenol	0.001	
Picloram	0.5	
Simazine	0.004	
Terbacil		0.09
Terbofos		0.0009
Toxaphene	0.003	
2,4-D	0.07	
2,4,5-TP (Silvex)	0.05	
Nutrient		
Nitrate (as N)	10.0	
Nitrite (as N)	1.0	

* Lifetime health advisory is EPA's specific level of chemical concentration in water that is acceptable for drinking over a person's life span.

potentially fatal condition known as methemoglobinemia, or "blue baby syndrome." Within the infant's digestive tract, nitrate is readily converted to toxic nitrite in the oral cavity and the stomach. The nitrite is then absorbed through the infant's gastro-intestinal tract into the blood and there it bonds to ferric (Fe³⁺) iron found in blood methemoglobin.

The nitrite prevents the reduction of ferric iron back to the ferrous (Fe²⁺) form required in hemoglobin for the transport of oxygen by blood. With greatly decreased blood-oxygen carrying capacity, the infant's tissues become oxygen-starved, the blood turns dark-brown and the skin exhibits a bluish tint. Nitrate in ground water may also be toxic to adults. Any questions or concerns about health effects of specific pesticides can be directed to DHES or MDA.

Livestock Water

Livestock require a good water supply, both in quality and quantity. Generally speaking, the maximum level of contaminants allowable in livestock water is higher than those levels acceptable for human consumption. Safe levels of agricultural chemicals in livestock water, especially pesticides, has not been thoroughly examined. Nitrate poses the greatest health hazard to

livestock (especially young animals).

Nitrate itself is not very poisonous, but it will become poisonous when it changes to nitrite in an animal's digestive system. Once converted it enters the bloodstream and reacts with hemoglobin to render it incapable of carrying oxygen in much the same manner as was previously described for infants. The animal will begin to show signs of a lack of oxygen such as labored breathing and a lack of coordination.

Nitrate poisoning is more likely to occur in ruminant animals such as cattle and sheep. Research also shows horses are more susceptible than swine and poultry. When livestock consume both well water and feed which is high in nitrate, the health hazard becomes even higher.

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Effects of nitrate in water used by livestock (Jackson, 1983, Olson, n.d., United States Department of Agriculture, Soil Conservation Service, 1982).

Reported As NO ₃ -N (nitrate-nitrogen)	Reported As NO ₃ (nitrate)	Interpretation
0-10 ppm	0-44 ppm	Safe for all animals
10-20 ppm	44-88 ppm	Safe for all livestock unless feed is also high in nitrates
20-40 ppm	88-176 ppm	Risky, especially over long periods of time
40-100 ppm	176-440 ppm	Interference syndrome likely (trembling, weakness)
100-200 ppm	440-880 ppm	Should not be used (acute losses possible)

The programs of the Montana Extension Service are available to all people regardless of race, creed, color, sex or national origin.

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